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ABSTRACT

A study examined the quantity and quality of ideas produced in freshman composition students' writing to determine whether computer assisted instruction (CAI) stimulates invention as well as or better than current invention instruction in traditional classrooms. Two CAI programs were used: QUEST, the systematic program that examines an item/event by asking questions, and FREE, an unsystematic program that involves writing about a subject for a short period and then reading the free-writing to find a central focus. The traditional heuristics were the same as those used for the CAI programs and were presented as handouts with the appropriate directions. The final data for each of the 72 subjects included two essays and a heuristic exercise for each of the essays. Findings showed no significant main effects in holistic quality for the type of heuristic used prior to the writing or for the mode of instruction. The results also showed no significant main effects in quantity of ideas for the type of heuristic used prior to the writing or for mode of instruction. However, there was a significant main effect for the type of heuristic used prior to the writing. Writers using the unsystematic heuristic--free writing followed by synthesis--used a greater percentage of the ideas produced by that heuristic. (HOD)

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COMPUTERS, INVENTION, AND THE POWER TO CHANGE STUDENT WRITING

a paper presented at the 37th annual Conference on College Composition and Communication

New Orleans, March 13, 1986

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COMPUTERS, INVENTION, AND THE POWER TO CHANGE STUDENT WRITING

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Promises made for computers and writing abound, but at the time of my study (Strickland 1984), only two experimental studies had looked at computers, invention, and the power to change student writing: those by Burns (1979) and Schwartz (1982). Before I discuss my dissertation study, I would like to review these studies by Burns and Schwartz.

Hugh Burns (1979) used 69 University of Texas at Austin volunteer student-subjects from four sections of an upper division English Composition course in a pre-test/post-test control group design. The four sections were each given two hours of lecture by the experimenter concerning their assigned heuristic strategy. The three experimental groups learned either Aristotle's topoi, the tagmemic heuristic, or the Pentad, while the control group was given a lecture on problem-solving. The three experimental groups were also given 30-minute practice sessions on the computer to familiarize themselves with the computer commands and keyboard functions. A post-test was administered the week following the lectures, consisting of a 30-minute test during which the subjects were to generate ideas for a paper using their assigned heuristic. The experimental groups were told that in responding to the computer, "if you think it, type it" (Burns, 1980, p.11). The control group was

directed "to list any and all ideas they had about the topic of their research paper" with a similar command, "if you think it, write it" (p.11). Thus, encouragement to write was computer-generated for the experimental groups and self-generated for the control group.

Two of Burns' findings are general: students had a positive attitude toward heuristics and computer-assisted instruction, and many students demonstrated a sustained use of the computer for the 30-minute testing time. But some of Burns' other findings merit further discussion. While he reports that all three computer groups showed statistically significant gains in the quantity of ideas produced when the control group did not, this finding is not as striking as it first appears to be. During the pre-test, all four groups were directed to list ideas for a topic in a 15-minute time limit and the resulting idea count was then doubled by Burns for comparison with his 30-minute post-test. During the post-test, each of the computer groups was given systematic heuristic questions to answer, which, not surprisingly, produced a statistically significant increase in ideas. The control group, on the other hand, was given the same directions as they had been on the pre-test but twice the pre-test time to list their ideas. Burns concludes that the computer group increase is all the more remarkable considering that the control group did "not even double the ideas they were able to write in the fifteen-minute exercise" (p. 18). These

findings more likely indicate that the heuristics Burns' experimental groups used in the post-test are better quantitative generators of ideas than the unsystematic approach all four groups used in the pre-test, the approach the control group used in the post-test. Therefore, I might restate Burns' findings as, in a 30-minute period, computer-assisted systematic heuristics generate a greater quantity of ideas than non-computer assisted unsystematic heuristics. More importantly, I conclude from Burns' study that unsystematic heuristics, such as idea-listing and brainstorming, by their very nature, do not generate ideas as a function of time; that is, the number of ideas produced does not necessarily increase with more time. In fact, Peter Elbow (1973) seems to find ten to fifteen minutes as a comfortable time period for his unsystematic heuristic, freewriting. Unfortunately, Burns did not consider a resulting piece of writing, and thus, there was no analysis of a final written product produced from any of these heuristic exercises.

Helen Schwartz (1982) compared in-class essays produced by a group of 40 students using a heuristic computer program, one specifically developed by her to analyze a character in a literary work, with an equal number of students' essays produced without benefit of a computer program. Although the essays produced by the computer group were not statistically different in quality, Schwartz comments that the CAI never seemed to harm the students' writings, that the computer group wrote longer and

more detailed essays, and that marginal students did improve. However, Schwartz does not consider why the longer and more detailed essays produced by the CAI group were not qualitatively "better" essays. Furthermore, she does not consider the reliability of her measurement of improvement in writing, the grades the essays received, scores she alone awarded.

Design

My study employed a 2 x 2 factorial design--mode of instruction (computer-assisted or traditional classroom) by type of heuristic (systematic or unsystematic). The dependent variables were (1) the difference in quality of the writing produced, measured by a pre-instruction versus post-instruction holistic assessment of the writing, (2) the difference between the quantity of ideas generated, measured by the number produced on a pre-instruction versus post-instruction count of ideas in completed heuristic exercises, and (3) the difference in the percentage of produced-ideas used in the subsequent pre-instruction versus post-instruction writing.

The subjects for my study were students enrolled in English 101: Freshman Composition for the Fall 1983 semester at a private, urban, two-year college in Buffalo, New York. The two participating instructors taught four matched pairs of Composition sections created by designating the groups as computer-assisted or traditional, systematic or unsystematic.

The subjects were assigned to treatment groups by random assignment within blocks and a random sample of nine subjects from each Composition section was selected to produce a cell size of 18 for data analysis.

My study looks at the quantity and quality of ideas produced, measuring the proportion of ideas produced in the heuristic exercises to those used in the actual writing, echoing a concern voiced by Rodrigues and Rodrigues (1984). Although Burns demonstrates the potential of CAI for invention, his study, as he himself admits, never addresses the important question of whether or not the use of CAI to stimulate rhetorical invention actually helps writers write. My study attempts to answer Burns' question "whether or not these CAI modules stimulate invention as well as (or better than) current instruction in invention" (1980, p. 27) by comparing CAI and traditional classroom instruction in invention strategies. My study distinguishes the two types of heuristics, systematic and unsystematic, which Burns used as his experimental and control groups. I compensated for the quality of the ideas by measuring the number which are actually used in the writing, feeling that it was not enough to count merely the number of ideas produced, where systematic heuristics have the advantage.

Procedure

At the beginning of the semester I gave all eight sections

two class hours of instruction concerning computer literacy and operation of a computer. During the following class, the groups received instruction in their designated heuristic, systematic or unsystematic, and were directed to use this heuristic at the beginning of each writing assignment and to turn it in with their draft. The CAI group was taught the heuristic on the computer; the traditional instruction group was taught the heuristic in class with handouts provided. I wrote two CAI programs, QUEST and FREE, used in the study (McDaniel, 1985). The systematic program, QUEST, based on Hartwell (1982), examines an item/event by asking questions. The definition questions are developed from the tagmemic system; for example, change: what was X in the past? what is X likely to become in the future? what couldn't it become? how much can it change before it becomes something else? The other questions are classical in tradition: classification, illustration, comparison and contrast, and analogy. The unsystematic program, FREE, based on Elbow (1973), involves writing about a subject for a short period and then reading the free-writing to find a central focus, Elbow's "center of gravity," which in turn becomes the subject for another free-writing. The traditional heuristics were the same as those used for the CAI programs and were presented as handouts with the appropriate questions/directions. Students in the computer groups received computer printouts of their work throughout the semester to serve as aids for their subsequent writing drafts. The students in the traditional groups had available their

handout sheets, containing directions for their heuristic and space for completion of the exercise. Although the instructors did not spend more class time teaching the heuristics, they did check periodically that the heuristic exercise was completed when conferencing with the students about their writings. Thus, collecting the heuristics with the writings was in keeping with normal classroom practice. The final data for each of the 72 subjects included two essays (pre-instruction and post-instruction) and a heuristic exercise for each of these pieces of writing.

Findings

A 2 x 2 analysis of variance (mode of instruction x type of heuristic) indicated that for:

1. holistic quality of the writing:

there were no significant main effects in holistic quality based on the type or heuristic used previous to the writing (F (1,68) = 2.19) nor on the presentation of instruction by computer or by traditional classroom methods (F (1,68) = 1.86). There was also no significant interaction (F (1,68) = 2.19) for mode of instruction and type of heuristic.

2. quantity of ideas:

there were no significant main effects in quantity of ideas based on the type of heuristic used previous to the writing (F

(1,68) = .876) nor on the presentation of instruction by computer or by traditional classroom methods (F (1,68) = .243). There was also no significant interaction (F (1,68) = .084) for mode of instruction and type of heuristic.

3. percentage of ideas produced during the heuristic exercises and used in the writing:

there was a significant main effect for the type of heuristic used previous to the writing (F (1,68) = 9.06, $p < .01$). Writers employing the unsystematic heuristic, freewriting followed by synthesis, used a greater percentage of the ideas produced by that heuristic in the actual writing than those writers who employed the systematic heuristic, the set of questions to be asked. The analysis also showed there was no significant main effect for computer or traditional classroom methods (F (1,68) = 1.35) and no significant interaction (F (1,68) = .696).

Conclusions and Implications

Real changes in writing are difficult to detect; perhaps using computer-assisted instruction for one semester is too short a time to assess what changes may have occurred, even though Burns (1979) claimed results achieved after one week and a brief exposure to CAI. Studies which find immediate differences following short-term exposure suggest that a quick growth of idea production immediately follows exposure to CAI, but this sharp

burst evens out over time.

Although Burns set out to investigate rhetorical invention, he learned some interesting things about computers. I set out to investigate computers and learned some interesting things about instruction in heuristics. A freewriting heuristic results in a product already in draft form and writers seem to take advantage of this early draft by incorporating a greater percentage of ideas in their final writing. My study showed that writers have a tendency to make wholesale transferrals of material from first draft to finished product. Teachers need be aware of this to help writers evaluate their ideas. On the other hand, writers working with a systematic heuristic use a smaller percentage of the ideas in their final writing. My study showed that teachers will need to impress upon writers that systematic heuristics produce a large quantity of ideas, though in a form quite different from a draft, and students must be willing to sort through this large quantity to find those ideas that will be useful in their writing.

Teachers should not expect miracles from computers. My study showed the presentation of heuristics with computer-assisted instruction certainly contributes to better writing but does not surpass the best method of teaching--dynamic, interactive classroom instruction. Furthermore, computer-assisted instruction forces students to spend time with rhetorical invention, an important behaviorial change since many

writers ignore invention completely. While writers are learning to spend time with invention, they will also learn that writers have a variety of heuristics to choose from, the appropriateness of which depends upon both the writing task at hand and their personal preference, and the availability of which depends on software designed to support this type of CAI. Although the presentation of heuristics with computer-assisted instruction contributes to better writing--both systematic and unsystematic heuristics help generate a greater number of ideas for use in writing--the focus of future research in computer-assisted instruction should be on the optimal use of the potential of a computer so that it becomes a unique mode of instruction rather than a surrogate teacher.

Figure 1: COMPUTERS, INVENTION, AND THE POWER TO CHANGE STUDENT WRITING

A COMPARISON OF THREE STUDIES:

	Burns	Schwartz	Strickland
Year of study	1979	1982	1984
No. of Students	69	80	72
Academic level	Upper-division Composition	Literature Class	Freshman Composition
Design	pre/post	pre/post	pre/post
Practice on computer	yes	yes	yes
Time Between evaluations	one week	semester	semester
Analysis of heuristic	yes	no	yes
Analysis of final writing	no	yes	yes
Significant difference	Quantity of ideas-CAI	none	% of ideas produced & used-freewriting

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